

## DIGITAL FREQUENCY-MULTIPLYING DLLs

### Abstract of the Disclosure

[0053] Digital delay-locked loops (DLLs) and methods are provided for signal frequency multiplication.

- 5 Analog delay elements of typical frequency-multiplying DLLs are replaced with digital and digitally-controlled elements including a variable delay line. The number of unit delay elements in the delay line can be selected to produce a desired output signal delay.
- 10 Phase-mixing of multiple variable delay line outputs achieves finer delay-time adjustments.